IBM Flex System Storage Expansion Node

IBM Redbooks Product Guide

The IBM® Flex System™ Storage Expansion Node is a locally attached storage node that is dedicated and directly attached to a single half-wide compute node. The Storage Expansion Node provides storage capacity for Network Attach Storage (NAS) workloads, providing flexible storage to match capacity, performance, and reliability needs.

Ideal wokloads include distributed database, transactional database, NAS infrastructure, video survellance and streaming solutions.

Figure 1 shows the IBM Flex System Storage Expansion Node attached to an IBM Flex System x240 Compute Node.

Figure 1. IBM Flex System Storage Expansion Node (right) attached to an x240 Compute Node (left)

Did you know?

The Storage Expansion Node adds 12 drive bays to the attached compute node and all bays in the expansion node are hot-swap. The drive bays slide out on an internal rail system; provided that a suitable RAID level is employed, a failed drive can be removed while the system is still running. With storage capacity of up to 12 TB, the Storage Expansion Node is ideal for applications that can use large amounts of additional local storage.

Part number information

Table 1. Ordering part number and feature code

Description	Part number	Feature code
IBM Flex System Storage Expansion Node	68Y8588	A3JF

The part number includes the following items:

- IBM Flex System Storage Expansion Node
- Double-wide shelf
- Documentation CD that contains the *Installation and Service Guide*
- Warranty information and Safety flyer and Important Notices document

Supported servers

The IBM Flex System Storage Expansion Node is supported when it is attached to the IBM Flex System compute nodes listed in Table 2. Only one Expansion Node can be attached to each compute node.

Table 2. Supported servers

Description	Part number	x220	x240	x440	p24L	p260	p460
IBM Flex System Storage Expansion Node	68Y8588	Y*	Y*	N	N	N	N

* The Storage Expansion Node requires that both processors be installed in the x220 and x240.

Features

The System Expansion Node has the following features:

- Connects directly to supported compute nodes via a PCIe 3.0 interface to the compute node's interposer connector (also known as the ETE connector)
- Support for 12 hot-swap 2.5-inch drives, accessible via a sliding tray
- Support for 6 Gbps SAS and SATA drives, both HDDs and SSDs
- Based on an LSI SAS2208 6 Gbps RAID on Chip (ROC) controller
- Supports RAID 0, 1, 5, 10, and 50 as standard. JBOD also supported. Optional RAID 6 and 60 with a Features on Demand upgrade.
- Optional 512 MB or 1 GB cache with cache-to-flash super capacitor offload
- Includes an expansion shelf to physically support the Storage Expansion Node and its compute node attached together
- Internal and external light path diagnostics
- Optional Feature on Demand upgrades for RAID 6, 60 support and SSD performance and caching enablers
- Optional support for SSD performance acceleration and SSD caching with Features on Demand upgrades

- Support for up to 64 virtual drives, up to 128 drive groups, up to 16 virtual drives per one drive group, and up to 32 physical drives per one drive group
- Support for logical unit number (LUN) sizes up to 64 TB
- Configurable stripe size up to 1 MB
- Compliant with Disk Data Format (DDF) configuration on disk (COD)
- S.M.A.R.T. support
- Managed through the IMMv2 management processor on the compute node and with the MegaRAID Storage Manager management software

Architecture

Figure 2 shows the architecture of the Storage Expansion Node when connected to a compute node.

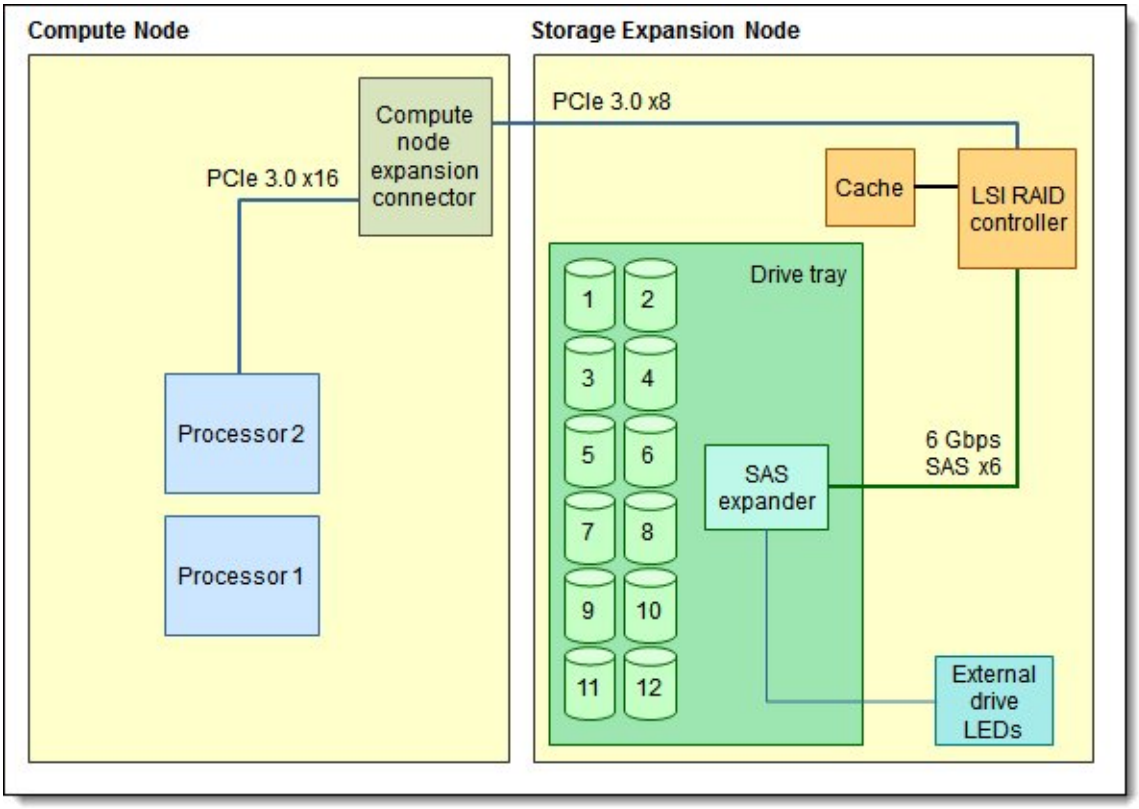

Figure 2. Architecture of the Storage Expansion Node

The Expansion Node connects to a standard-width compute node using the interposer cable, which plugs into the expansion connector on the compute node. This link forms a PCIe 3.0 x8 connection between Processor 2 on the compute node and the LSI RAID controller in the Expansion Node. The result is that the compute node sees the disks in the expansion node as locally attached. Management of the Storage Expansion Node is via the IMM2 located on the compute node.

Note: The expansion connector in the x220 and x240 compute nodes is routed through processor 2. Therefore, processor 2 must be installed in the compute node.

Supported disk drives

The Storage Expansion Node is a PCIe 3.0 and a SAS 2.1 complaint enclosure supporting up to twelve 2.5-inch drives. The drives can be HDD or SSD, and both SAS or SATA. Drive modes supported are JBOD or RAID-0, 1, 5, 6, 10, 50, and 60.

The drives are accessed by opening the handle on the front of the Storage Expansion Node and sliding out the drive tray. Opening the drive tray can be done while it is operational. Figure 3 shows the Storage Expansion Node connected to an x240 compute node and with the drive tray extended part way out. With the drive tray extended, all twelve hot-swap drives can be accessed on the left side of the tray.

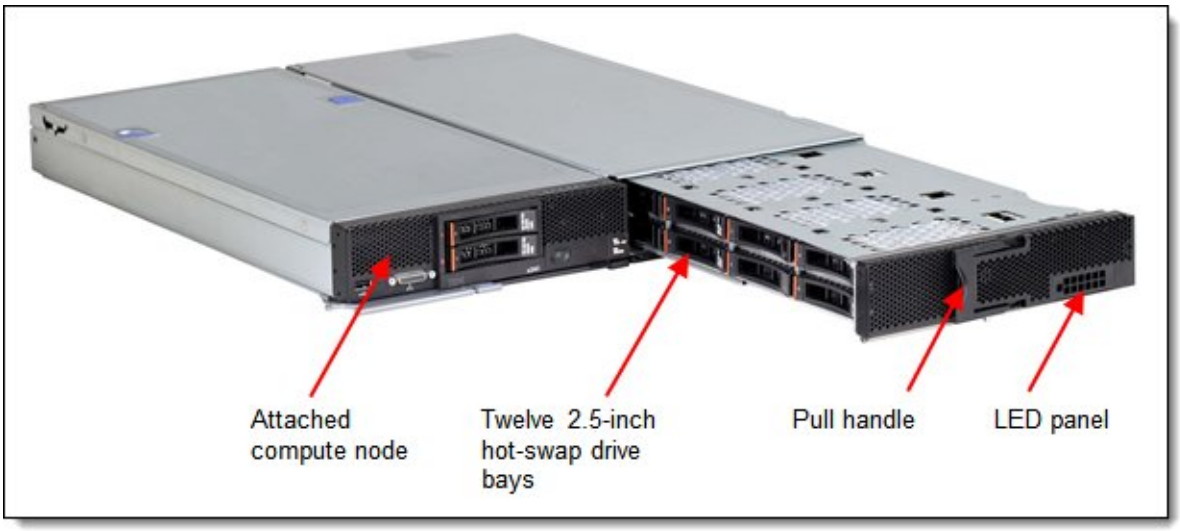

Figure 3. Storage Expansion Node with drive tray part way extended

The following table lists the hard disk drives (HDDs) and solid state drives (SSDs) supported within the Storage Expansion Node. Both SSDs and HDDs can be installed inside the unit at the same time. Preferred practice when creating logical drives is to use similar disk types. For example, for a RAID 1 pair, choose identical drive types, SSD or HDD.

Table 3. Supported drives

Part number	Feature code	Description	Maximum supported
NL SATA HDDs			
81Y9722	A1NX	IBM 250GB 7.2K 6Gbps NL SATA 2.5" SFF HS HDD	12
81Y9726	A1NZ	IBM 500GB 7.2K 6Gbps NL SATA 2.5" SFF HS HDD	12
81Y9730	A1AV	IBM 1TB 7.2K 6Gbps NL SATA 2.5" SFF HS HDD	12
10K SAS HDDs			
81Y9650	A282	IBM 900GB 10K 6Gbps SAS 2.5" SFF HS HDD	12
90Y8872	A2XD	IBM 600GB 10K 6Gbps SAS 2.5" SFF G2HS HDD	12
90Y8877	A2XC	IBM 300GB 10K 6Gbps SAS 2.5" SFF G2HS HDD	12
Solid state drives			
90Y8643	A2U3	IBM 256GB SATA 2.5" MLC HS Enterprise Value SSD	12

Feature upgrades

The Storage Expansion Node supports the upgrades listed in the following table.

Table 4. Supported adapter cards

Part number	Feature code	Description	Maximum supported
Cache upgrades			
81Y4559	A1WY	ServeRAID M5100 Series 1GB Flash/RAID 5 Upgrade for IBM System x®	1*
81Y4487	A1J4	ServeRAID M5100 Series 512MB Flash/RAID 5 Upgrade for IBM System x	1*
Features on Demand upgrades (license only)			
90Y4410	A2Y1	ServeRAID M5100 Series RAID 6 Upgrade for IBM Flex System	1**
90Y4447	A36G	ServeRAID M5100 Series SSD Caching Enabler for IBM Flex System	1**
90Y4412	A2Y2	ServeRAID M5100 Series Performance Accelerator for IBM Flex System	1**

* The cache upgrades are mutually exclusive.
** FoD upgrades for ServeRAID are system-wide: If you have these features installed on the M5115 in the compute node they will automatically be activated on the LSI controller in the Storage Expansion Node.

ServeRAID M5100 Series 512MB and 1GB Flash Upgrade option part numbers include the following items:

- Cache module
- Flash power module
- Cable

The cache module is installed at the rear of the Storage Expansion Node and the power module is installed near the front of the expansion node. The provided cable is used to connect the cache module to the power module.

Figure 4 shows the flash-backed cache module, power module, and power cable.

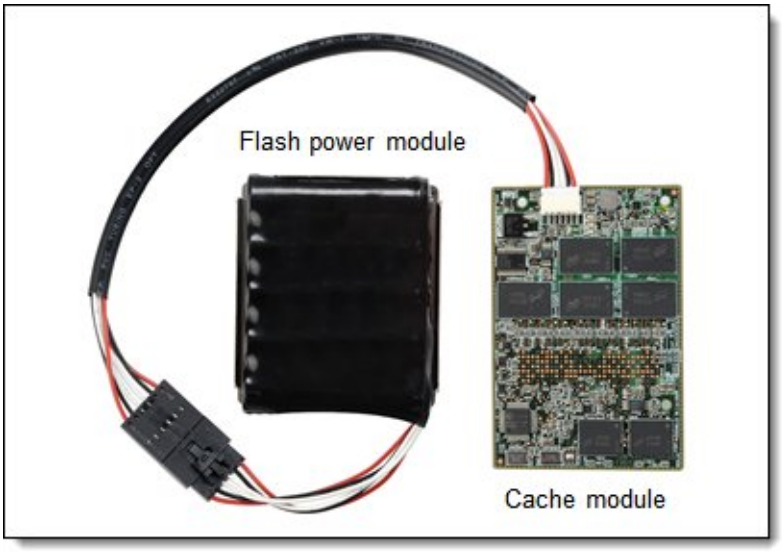

Figure 4. Flash-backed cache module, power module, and power cable

The following license-only Features on Demand upgrades are available;

- RAID 6 Upgrade (90Y4410)

  Adds support for RAID 6 and RAID 60. This is a Feature on Demand license.

- Performance Upgrade (90Y4412)

  The Performance Upgrade for IBM Flex System (implemented using the LSI MegaRAID FastPath software) provides high performance I/O acceleration for SSD-based virtual drives by using an extremely low latency I/O path to increase the maximum I/O per second (IOPS) capability of the controller. This feature boosts the performance of applications with a highly random data storage access pattern, such as transactional databases. Part number 90Y4412 is a Feature on Demand license.

- SSD Caching Enabler for traditional hard drives (90Y4447)

  The SSD Caching Enabler for IBM Flex System (implemented using the LSI MegaRAID CacheCade Pro 2.0) is designed to accelerate the performance of hard disk drive (HDD) arrays with only an incremental investment in solid-state drive (SSD) technology. The feature enables the SSDs to be configured as a dedicated cache to help maximize the I/O performance for transaction-intensive applications, such as databases and web serving. The feature tracks data storage access patterns and identifies the most frequently accessed data. The hot data is then automatically stored on the SSDs that are assigned as a dedicated cache pool on the ServeRAID controller. Part number 90Y4447 is a Feature on Demand license. This feature requires that at least one SSD drive is installed.

FoD upgrades are system-wide: The FoD upgrades are the same ones as used with the ServeRAD M5115 available for use internally in the x220 and x240 compute nodes. If you have an M5115 installed in the attached compute node and have installed any of these upgrades, the upgrades will automatically be activated on the LSI controller in the Storage Expansion Node. You do not need to purchase the FoD upgrades separately for the expansion node.

LED indicators

The Storage Expansion Node has a number of LEDs on the lower right front for identification and status purposes, as shown in Figure 5.

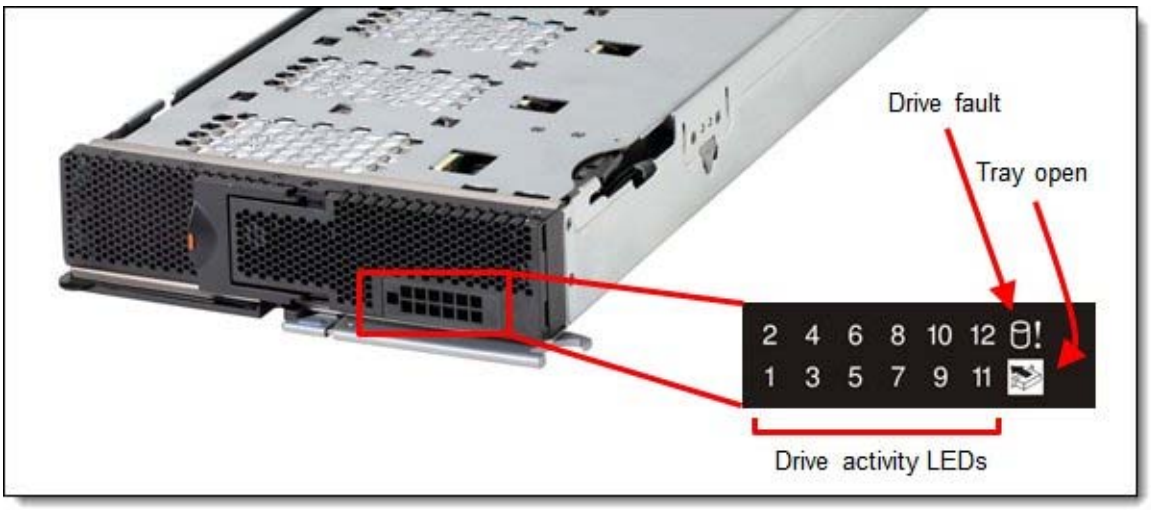

Figure 5. LEDs on the front of the Storage Expansion Node

Table 5 identifies the meanings of the LEDs.

Table 5. External LED status table

LED	Color	Meaning
Activity light (each drive bay)	Green	• Blinks with Activity, displaying drive number.
Fault/Locate	Amber	• Solid: Indicates a fault on one of the drives • Blink: One of the drives is set to “identify”
Tray Open	Amber	• Flash/beep 15 sec interval: Drawer is not fully closed. • Flash/beep 5 sec interval: Drawer has been opened to long, close drawer immediatly • Flash/beep .25 sec interval: Expansion node has reached thermal threshold. Close door immediately to avoid drive damage.

In addition to the lights described in the previous table, there are LEDs locally on each of the drive trays. These lights can be observed when the drive tray is extended and the unit is operational. A green LED indicates disk activity and an amber LED indicates a drive fault.

With the Storage Expansion Node removed from the Flex System chassis and its cover removed, there are additional LEDs visible. If there is a fault detected then the relevant LED will light:

- Flash/RAID adapter: RAID Cache card fault.
- Control panel: LED panel card not present
- Temperature: A temperature event has occured
- Storage expansion: Fault on the storage expansion unit
- Light path: Verify that the light path diagnostic function, including the battery, is operating properly

Physical specifications

Dimensions and weight (approximate):

- Height: 56 mm (2.2 in.)
- Depth: 504 mm (19.8 in.)
- Width: 229 mm (9.2 in.)
- Maximum weight: 5.9 kg (13 lb)

Shipping dimensions and weight (approximate):

- Height: 240 mm (9.5 in.)
- Depth: 680 mm (26.8 in.)
- Width: 601 mm (23.7 in.)
- Weight: 9.5 kg (21 lb)

Operating environment

When the unit is powered on, it is supported in the following environment:

- Temperature: 5° C to 40° C (41° F to 104° F)
- Humidity, noncondensing: -12° C dew point (10° F) and 8% - 85% relative humidity
- Maximum dew point: 24° C (75° F)
- Maximum altitude: 3048 m (10,000 ft)
- Maximum rate of temperature change: 5° C/hr (41° F/hr)

Regulatory compliance

The unit conforms to the following standards:

- ASHRAE Class A3
- FCC - Verified to comply with Part 15 of the FCC Rules Class A
- Canada ICES-004, issue 3 Class A
- UL/IEC 60950-1
- CSA C22.2 No. 60950-1
- NOM-019
- Argentina IEC 60950-1
- Japan VCCI, Class A
- IEC 60950-1 (CB Certificate and CB Test Report)
- China CCC (GB4943); (GB9254, Class A); (GB17625.1)
- Taiwan BSMI CNS13438, Class A; CNS14336
- Australia/New Zealand AS/NZS CISPR 22, Class A
- Korea KN22, Class A, KN24
- Russia/GOST ME01, IEC 60950-1, GOST R 51318.22, GOST R
- 51318.249, GOST R 51317.3.2, GOST R 51317.3.3
- IEC 60950-1 (CB Certificate and CB Test Report)
- CE Mark (EN55022 Class A, EN60950-1, EN55024, EN61000-3-2,
- EN61000-3-3)
- CISPR 22, Class A
- TUV-GS (EN60950-1/IEC 60950-1, EK1-ITB2000)

Related publications

For more information, see the following resources:

- IBM US Announcement Letter
  http://ibm.com/common/ssi/cgi-bin/ssialias?infotype=dd&subtype=ca&&htmlfid=897/ENUS112-185
- IBM Flex System product page
  http://ibm.com/systems/flex
- IBM Flex System Information Center
  http://publib.boulder.ibm.com/infocenter/flexsys/information/index.jsp
- IBM ServerProven hardware compatibility page for IBM Flex System
  http://www.ibm.com/systems/info/x86servers/serverproven/compat/us/
- *IBM Flex System x240 Compute Node*, IBM Redbooks® Product Guide
  http://www.redbooks.ibm.com/abstracts/tips0860.html
- *IBM Flex System x220 Compute Node*, IBM Redbooks Product Guide
  http://www.redbooks.ibm.com/abstracts/tips0885.html
- *ServeRAID M5115 SAS/SATA Controller for IBM Flex System*, IBM Redbooks Product Guide
  http://www.redbooks.ibm.com/abstracts/tips0884.html?Open

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